

## ON A SMALL COLLECTION OF ENTOCYTHERID OSTRACODS WITH THE DESCRIPTIONS OF THREE NEW SPECIES

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*Abstract.*—Three new entocytherid ostracods, *Ascetocythere jezerinaci*, *Ankylocythere carpenteri*, and *Ornithocythere thomai*, infesting burrowing crayfishes, are described from Lee County, Virginia, Elmore County, Alabama, and Washington County, Alabama, respectively. Reports of the ostracods infesting crayfishes from nine additional collections containing burrowing crayfishes from Kentucky, Indiana, Ohio, Virginia, and West Virginia are also presented.

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This report is based upon ostracods gleaned from 12 containers in which crayfishes from Alabama, Kentucky, Indiana, Ohio, Virginia, and West Virginia had been preserved. In each container, at least one of the crayfish (either *Cambarus (Jugicambarus) dubius* Faxon, 1884, or *C. (Lacunicambarus) diogenes* Girard, 1852) that had been placed in it had been captured from a burrow. In five containers, only representatives of one of these two burrowing species had been placed in the jars. Twelve species of ostracods, three of which are previously undescribed, were among the specimens found. Following the descriptions of the new species, new locality records are listed together with remarks concerning the ostracods and their host crayfishes.

Previous records of the hosts of ostracods belonging to the genera *Ascetocythere* and *Ornithocythere* provide evidence that these ostracods are probably restricted to crayfishes that are recognized as primary burrowers. The same crayfishes, however, frequently have been found to harbor members of the other entocytherid genera encountered in the collections reported here. Thus we are reasonably certain that among those specimens from jars in which more than one host crayfish species was preserved, the members of *Ascetocythere* and *Ornithocythere* were symbionts of the burrowing crayfish; the other ostracods could have been using any or all of the crayfishes present as hosts.

### *Ascetocythere jezerinaci*, new species

Fig. 1a-d

*Description.*—Male: Eye pigmented, located approximately 0.28 shell length from anterior margin. Shell (Fig. 1a) subovate, about 1.7 times as long as high and margins lacking prominences and emarginations. Submarginal setae more abundant anteriorly and posteriorly than ventrally; none observed on dorsal margin.

Copulatory complex (Fig. 1b) with peniferum bearing 2 prominences extending anteriorly from subterminal expansion. More dorsal (anterior) process heavy, its length about half minimum anterior-posterior diameter of peniferum, tapering, and flanking anterodorsally directed penis. Ventral process shorter, more heavily

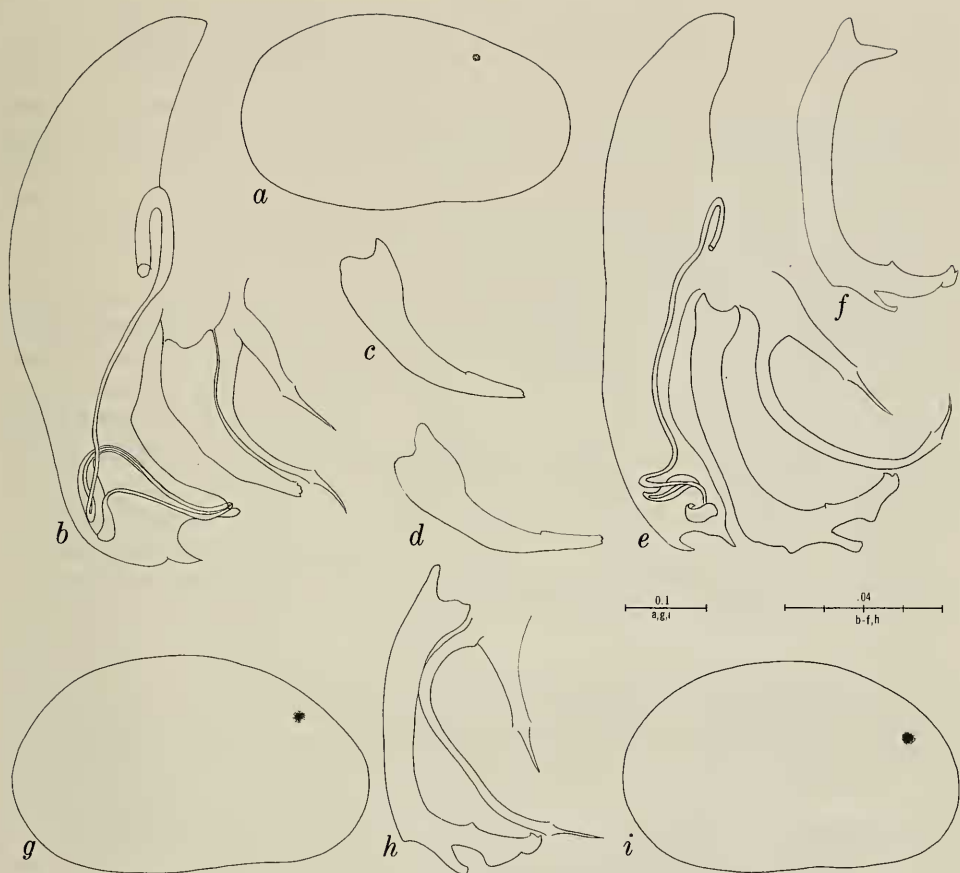


Fig. 1. *Asctocythere jezerinaci* (a-d) and *Ankylocythere carpenteri* (e-i): a, g, Dextral view of shell of holotype; b, c, d, e, Copulatory complex; c, d, f, Clasper apparatus; h, Clasper apparatus and fingers; i, Dextral view of shell of allotype. (Scales in mm.)

sclerotized, acute, and slightly arched. Penis complex long and extending anteriorly, emerging on anterior surface of ventral expansion near tip of anterior process; 2 elements contiguous only along distal third of prostatic duct. Clasper apparatus (Fig. 1c, d) arched but not clearly divisible into horizontal and vertical rami, massive basally, and tapering along distal four-fifths of its length; postaxial border entire, preaxial border with notch at base of distal third; apex with 3 or 4 rounded denticles. Both dorsal and ventral fingers moderately robust, latter gently curved from base and directed anteroventrally.

*Measurements.*—Holotype: length of shell 392  $\mu$ ; height of shell 217  $\mu$ ; corresponding measurements of the paratypic male 399  $\mu$  and 217  $\mu$ , respectively.

*Type-locality.*—Creek and burrows 2.2 air kilometers (1.3 miles) north of Stickleyville, Lee County, Virginia (36°33'N, 82°55'W). The specimens on which this description is based were removed from debris in a jar that had contained specimens of the crayfishes *C. (J.) dubius*, *C. (Cambarus) bartonii* (Fabricius, 1798),

and *C. sp.* Also infesting these crayfishes were the entocytherids *Donnaldsoncythere donnaldsonensis* (Klie, 1931) and *Uncinocythere simondsi* (Hobbs and Walton, 1960).

*Disposition of types.*—The holotypic and paratypic male are deposited in the National Museum of Natural History, Smithsonian Institution, numbers 204400 and 204401, respectively.

*Range and specimens examined.*—This ostracod is known only from the type-locality, from which we have seen only the two type-specimens.

*Host and entocytherid associates.*—See “Type-locality.”

*Relationships.*—*Ascetocythere jezerinaci*, a member of the Asceta Group (Hobbs and Hart 1966:39), has its closest affinities with *As. didactylata* Hobbs and Hart (1966). Although the processes borne on the ventral extremity of the peniferum of the latter are directed ventrally and those of *As. jezerinaci* are disposed anteriorly, the relative positions of the processes made them readily comparable. Moreover, except for fewer, only one, denticles on the preaxial border of the clasping apparatus in *As. jezerinaci*, this structure is strikingly similar in the two species, as are most other features.

Hobbs and Walton (1975:6–7) presented a key to the then-known members of the genus. To include the new species described here in it, the following is offered to replace couplet 12 in their key.

- 12(3'). Ventral part of peniferum with angular flange . . . . . 13
- 12'. Ventral part of peniferum lacking angular flange . . . . . 16
- 16(12'). Processes on ventral extremity of peniferum directed ventrally; preaxial border of clasping apparatus with more than one denticle . . . . . *As. didactylata* Hobbs and Hart, 1966:43
- 16'. Processes on ventral extremity of peniferum directed anteriorly; preaxial border of clasping apparatus with single denticle . . . . .  
. . . . . *As. jezerinaci*, new species

*Etymology.*—This entocytherid is named in honor of Raymond F. Jezerinac of Ohio State University at Newark, a student of crayfishes and one of the collectors of most of the material examined in this study.

*Ankylocythere carpenteri*, new species

Fig. 1e–i

*Description.*—Male: Eye pigmented, located about 0.2 shell length from anterior margin. Shell (Fig. 1g) subovate, about 1.6 times as long as high, margins lacking prominences and emarginations. Submarginal setae present anteriorly and posteriorly, sparse ventrally, and absent dorsally.

Copulatory complex (Fig. 1e) with arched peniferum moderately deeply excavate ventrally resulting in acute, anteroventrally directed prominences anteriorly and posteriorly, posterior prominence distinctly curved anteriorly. Penis complex situated in ventral sixth of peniferum but exhibiting no distinctive features. Clasping apparatus (Fig. 1e, f, h) L-shaped with vertical ramus 1.6 to 1.9 times as long as horizontal ramus. Former slightly arched, and neither preaxial nor postaxial borders armed; preaxial border of horizontal ramus with single tooth near mid-

length; postaxial margin with (1) distinct angular bend at or near junction of vertical and horizontal rami, in some views appearing rounded and slightly produced (Fig. 1e); (2) prominent slender talon, situated slightly proximal to level of tooth on preaxial border, directed anteroventrally and somewhat mesially; and (3) well defined excrescence slightly proximal to midway between distal base of talon and two apical denticles. Dorsal finger prominent, straight, and bearing simple apical seta; ventral finger moderately slender, curved throughout length or along proximal and distal fourths, and directed anteroventrally.

Female: Eye located about 0.14 shell length from anterior margin. Shell (Fig. 1i) subovate, 1.6 times as long as high, and shallowly excavate ventrally anterior to midlength. Shell margin otherwise entire. Submarginal setae present but rather widely spaced anteriorly, ventrally, and posteriorly.

Genital apparatus, like that of other members of genus, consisting of simple, slightly tapering papilla.

*Measurements.*—The length of five males ranges from 378 to 399  $\mu$ , mean  $388 \pm 7.98 \mu$ ; the height ranges from 238 to 252  $\mu$ , mean  $244 \pm 5.9 \mu$ ; corresponding measurements of five females are 399 to 413  $\mu$ , mean  $405 \pm 8.6 \mu$ , and 245 to 252, mean  $248 \pm 3.83 \mu$ .

*Type-locality.*—Small stream entering Coosa River 1.7 kilometers upstream from Bibb Graves Bridge at Wetumpka, Elmore County, Alabama (T. 18N, R. 18E, Sec. 13). The host was *C. (L.) diogenes*.

*Disposition of types.*—The holotypic male, allotypic female, and a dissected paratypic male are deposited in the National Museum of Natural History, Smithsonian Institution, numbers 204402, 204403, and 204404, respectively. Paratypic males are in the collections of the British Museum (Natural History) and that of H. H. Hobbs III, Wittenberg University.

*Range and specimens examined.*—*Ankylocythere carpenteri* is known only from the type-locality where 11 specimens were obtained from five crayfish.

*Host and entocytherid associates.*—See "Type-locality."

*Relationships.*—*Ankylocythere carpenteri* is allied to those members of the genus that have a well developed talon on the horizontal ramus of a clasping apparatus that does not have a conspicuously long vertical ramus. Among its closer relatives are *Ankylocythere freyi* Hobbs III, 1978; *Ank. krantzi* Hobbs III, 1978; *Ank. tiphophila* (Crawford, 1959); and *Ank. sinuosa* (Rioja, 1942). It differs from all other members of the genus, in possessing a distinct angle on the postaxial surface of the clasping apparatus at, or immediately adjacent to, the junction of the horizontal and vertical rami.

*Etymology.*—This ostracod is named for Michael R. Carpenter of the Smithsonian Institution who collected the specimens on which the above description is based and who has assisted one of us (HHH) in the laboratory on numerous occasions during the past decade.

#### *Ornithocythere thomai*, new species

Fig. 2

*Description.*—Male: Eye pigmented, located about one-sixth shell length from anterior margin. Shell (Fig. 2a) subovate, 1.8 times as long as high, and greatest height about 1.4 times that at level of eye, margins entire; submarginal setae closer

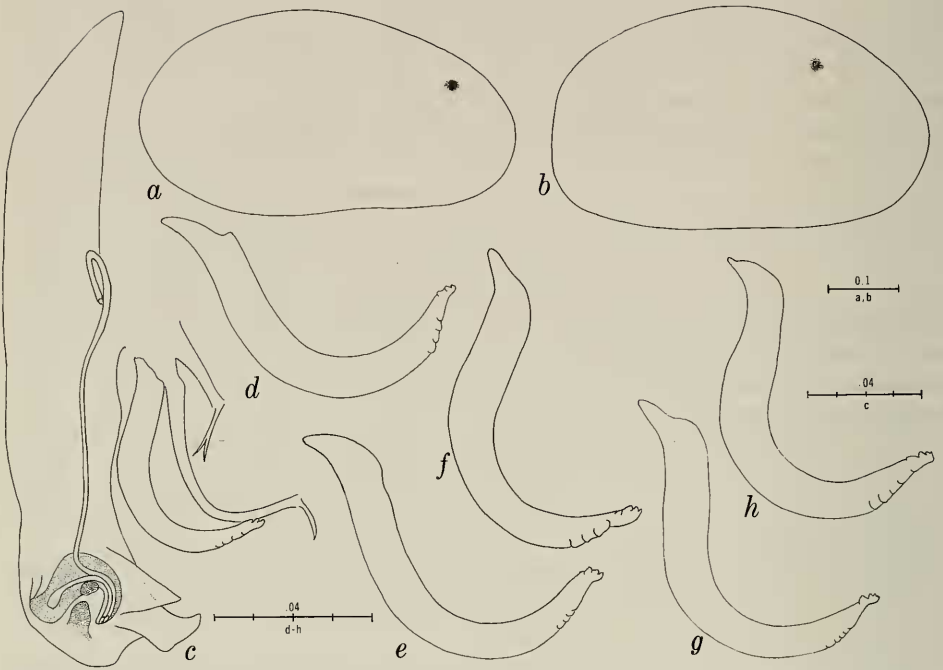


Fig. 2. *Ornithocythere thomai*: a, Dextral view of shell of holotype; b, Same of allotype; c, Copulatory complex of dissected male paratype; d-h, Clasping apparatus. (Scales in mm.)

together anteriorly and posteriorly than ventrally and dorsally, very few along latter margin.

Copulatory complex (Fig. 2c) with peniferum extending ventrally clearly beyond clasping apparatus, ventral part strongly sclerotized, and anterodorsally directed beaklike prominence with ventral subangular knob near midlength. Hyaline, triangular, lamelliform process situated at proximal base of beaklike prominence, its apex directed anteriorly. Penis conspicuous, U-shaped, and situated in ventral fifth of peniferum, its two components contiguous for about half length of prostatic element. Penis guides strongly sclerotized. Clasping apparatus (Fig. 2d-h) broadly C-shaped, not clearly divisible into vertical and horizontal rami, gently tapering in diameter almost from base. Preaxial border entire almost to apex, there bearing 4 apical denticles; postaxial border also entire except for series of 4 or 5 rounded to subangular prominences on distal fourth. Ventral finger (excluding apical setae) about 4 times length of dorsal finger, straight along proximal two-thirds, distal third bent anteriorly at 90 degrees, bearing simple seta; dorsal finger straight, directed anteroventrally, and terminating in apparently bifurcate seta.

Triunguis female: Eye situated about one-third shell length from anterior margin. Shell (Fig. 2b) about 1.7 times as long as high, truncate posteriorly, greatest height 1.4 times that at level of eye. Submarginal setae distributed as in male.

Genital apparatus consisting of short, sclerotized, conical papilla; apparently flexible hyaline rod, coated with detritus, extending pendant from apex.

*Measurements.*—The length of the shells of seven males ranges from 455 to 504  $\mu$ , mean  $487 \pm 15.6 \mu$ , the height from 252 to 273  $\mu$ , mean  $266 \pm 7.0 \mu$ ; corresponding measurements of the two females are 504  $\mu$  and 287 to 294  $\mu$ .

*Type-locality.*—Burrows along drainage ditch adjacent to Crosbys Creek at Millry on State Route 17, Washington County, Alabama (T.8N, R.3W, Sec. 25). The host crayfish was *C. (L.) diogenes*, which harbored no other entocytherids except *Ank. freyi*.

*Disposition of types.*—The holotypic male, allotype, and a dissected paratypic male are deposited in the National Museum of Natural History, Smithsonian Institution, numbers 204405, 204406, and 204407, respectively. Paratypic males are in the British Museum (Natural History), in the collection of H. H. Hobbs III, Wittenberg University, and in the Smithsonian Institution.

*Range and specimens examined.*—Known only from the type-locality. A total of eight males and four triunguis females were obtained from the six crayfish collected.

*Host and entocytherid associates.*—See “Type-locality.”

*Relationships.*—*Ornithocythere thomai* has its closest affinities with *O. aetodes* Hobbs III, 1970. The two are remarkably similar in most features, particularly in the structure of the ventral part of the peniferum; however, the translucent triangular element is much more prominent in *O. thomai*, as is obvious since this structure has been overlooked previously in *O. aetodes*. The two species may be distinguished most readily by the rounded, as opposed to the angular, clasping apparatus of *O. thomai*.

*Etymology.*—This ostracod is named in honor of Roger F. Thoma of the Ohio Environmental Protection Agency, a student of crayfishes, and the other collector of most of the specimens that are mentioned in this study.

### New Locality Records for Entocytherids and Their Hosts

#### ALABAMA:

1. Crosbys Creek and drainage ditch at Millry on State Route 17, Washington County, 22 Apr 1970; Horton H. Hobbs, Jr., collector.

Entocytherids: *Ank. freyi* Hobbs, and *O. thomai*, new species.

Host: *C. (L.) diogenes* Girard, 1852.

*Remarks.*—*Ankylocythere freyi* was described from specimens that were infesting the same host species as that reported herein from Crenshaw County, Alabama. Whereas the new locality falls within the range of the species recorded by Hobbs III, it lies slightly to the north of those records plotted by him (1978: Fig. 3) west of the Tombigbee River. Information relative to *O. thomai* is presented following its description above.

2. Branch entering the Coosa River 1.7 kilometers upstream from Bibb Graves Bridge at Wetumpka, Elmore County, 12–13 Aug 1976; Michael R. Carpenter, collector.

Entocytherid: *Ank. carpenteri*, new species.

Host: *C. (L.) diogenes*.

*Remarks.*—As noted above, this ostracod is known only from the type-locality, where no other entocytherids were found infesting the host.

## INDIANA:

Roadside ditch 6.1 air kilometers west of New Point, just north of State Route 46, Decatur County, 14 June 1980; John A. Thoma, Roger F. Thoma, and Raymond F. Jezerinac, collectors.

Entocytherid: *Dactylocythere crawfordi* Hart, 1965.

Host: *C. (L.) diogenes*.

*Remarks.*—This is the third record of the occurrence of *Dt. crawfordi* in Indiana; the other two are in the basins of the Wabash and West Fork of the White rivers. The locality cited above lies in the watershed of the East Fork of the White River, some 85 kilometers southeast of that in Marion County listed by Hart and Hart (1974:55).

## KENTUCKY:

1. Patton's Creek (Ohio River basin), 3.4 kilometers northwest of Sligo on County line road, Oldham-Trimble counties, 19 Apr 1980; J.A.T., R.F.J., and Mathew McClusky, collectors.

Entocytherids: *Dactylocythere exoura* Hart and Hart, 1966, *Dt. ungulata* (Hart and Hobbs, 1961), and *Donnaldsoncythere donnaldsonensis* (Klie, 1931).

Hosts: *Cambarus (C.) ortmanni* (Williamson, 1907), *C. (Erebicambarus) ornatus* Rhoades, 1944a, *C. (L.) diogenes*, and *Orconectes rusticus* (Girard, 1852).

*Remarks.*—Hart and Hart (1974:58) recorded only two localities for *Dt. exoura*, one each in Grant and Oldham counties. The new locality is no more than six or seven kilometers north of that in Oldham County cited by the Harts, and the hosts are among those previously cited. Although the Oldham-Trimble locality does not alter the limits of the range of *Dt. ungulata* depicted by Hart and Hart (Fig. 49), it does provide a new county record and a precise locality on the northwestern boundary. Neither this nor any of the following records for the wide-ranging *Dn. donnaldsonensis* is noteworthy.

2. Big Creek (tributary to Levisa Fork, Big Sandy River basin), 3.4 kilometers northeast of Dunlap on State Route 194, Pike County, 18 Jun 1981; R.F.T., Raymond J. Jezerinac, and R.F.J., collectors.

Entocytherids: *Ascetocythere sclera* Hobbs and Hart (1966) and *Dn. donnaldsonensis*.

Hosts: *Cambarus (C.) sciotensis* Rhoades, 1944b, *C. (J.) dubius*, *Cambarus* sp., and *Orconectes* sp.

*Remarks.*—To our knowledge, this is the first record of the occurrence of *As. sclera* in Kentucky; however, having been found in neighboring parts of Virginia and West Virginia (Hart and Hart 1974:41), its occurrence in the extreme southeastern part of Kentucky is not a surprise. Our specimens exhibit no variations that set them apart from those from elsewhere.

## OHIO:

Vernal pond, 6.9 kilometers northeast of Hebron on Licking Twp. Road 305, Licking County, 9 Apr 1981; R.F.T. and Craig Ciola, collectors.

Entocytherid: *Dt. crawfordi*.

Host: *C. (L.) diogenes*.

*Remarks.*—This record extends the known range of *Dt. crawfordi* about 60 kilometers to the east into the Muskingum River basin.

#### VIRGINIA:

1. Along Hobbs Branch (tributary of Levisa Fork, Big Sandy River basin), about 1.0 kilometer southeast of State Route 35, 5.1 kilometers east of Grundy, Buchanan County, 18 Jun 1981; R.F.T., R.F.J., and R.J.J., collectors.

Entocytherids: *As. sclera* and *Dn. donnaldsonensis*.

Hosts: *C. (C.) sciotensis*, *C. (J.) dubius*, and *Cambarus* sp.

2. 2.2 air kilometers north of Stickleyville, along tributary to Wallen Creek, Powell River basin, Lee County, 20 Jun 1981; R.F.J. and R.F.T., collectors.

Entocytherids: *As. jezerinaci*, new species, *Dn. donnaldsonensis*, and *Uncinocythere simondsi*.

Hosts: *C. (C.) cavatus* Hay, 1902, *C. (J.) dubius*, and *Cambarus (C.)* sp.

*Remarks.*—All of the information available to us concerning *As. jezerinaci* is presented immediately following the description of this entocytherid. The presence of *U. simondsi* here represents a new state record.

3. Spring seep along State Route 871, 0.7 kilometer north of the junction with Route 646, Scott County, 9 Jul 1981; collectors (?).

Entocytherids: *Ascetocythere ozalea* Hobbs and Hart, 1966; and *Dn. donnaldsonensis*.

Host: *Cambarus (J.) dubius*.

*Remarks.*—This is the third locality reported for *As. ozalea* which, insofar as we are aware, is endemic in the Tennessee River basin in Virginia; the other two localities are in Scott and Russell counties, Virginia (Hart and Hart 1974:40).

4. Mud Fork (Bluestone-New River basin), about 0.9 kilometer north of the town of Mud Fork (17.9 kilometers west southwest of Bluefield, West Virginia), on County Road 643, 19 Jun 1981; R.F.T., R.F.J., and R.J.J., collectors.

Entocytherid: *Dn. donnaldsonensis*.

Hosts: *C. (C.) sciotensis*, *C. (J.) dubius*, and *Cambarus* sp.

#### WEST VIRGINIA:

1. Panther Creek State Forest (Tug Fork-Big Sandy River basin), 10 kilometers south of Panther, McDowell County, 19 Jun 1981; R.F.T., R.F.J., and R.J.J., collectors.

Entocytherids: *Dn. donnaldsonensis*, *Phymocythere phyma* (Hobbs and Walton, 1962), and *U. simondsi*.

Hosts: *Cambarus (C.) sciotensis*, *C. (J.) dubius*, *Cambarus* sp., and *Orconectes* sp.

*Remarks.*—The presence of *P. phyma* at this locality represents the southwesternmost record for the species, also the first report of its presence in the Guyandot drainage system. *Uncinocythere simondsi* has not been previously reported from West Virginia.

2. Tributary of West Fork of Twelve Pole Creek (Ohio River basin), Cabwaylingo State Forest, 4.3 kilometers northwest of Wilsondale, Wayne County, 18 Jun 1981; R.F.T., R.F.J., and R.J.J., collectors.



Entocytherids: *As. sclera* and *Donnaldsoncythere donnaldsonensis*.  
 Hosts: *C. (J.) dubius* and *Cambarus* sp.

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